

**Information Systems Development Support (ISDS) Contract
Contract Work Order (CWO) Implementation Plan**

for

**CWO 9 - DSCC Tracking Subsystem (DTK) Software
Metric Data Assembly**

Developed by
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Under

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for the

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Foreword

Due to the timing of these Work Implementation Plans (WIPs) relative to (i.e., subsequent to) the start of the current DSN development efforts, a slightly different approach is being used than would normally be the case. WIPs document the planning that normally precedes development. The document then grows and is modified, if necessary, to reflect a dynamic development environment. Since much of the detail already exists for tasks already in progress at the beginning of the ISDS contract, the WIP references existing detail without significant elaboration. The WIP is envisioned as a central repository to pull together, by reference or inclusion, all the information available for a particular development task. The objective of this exercise is to provide all the information necessary to plan for, then to monitor and control the progress of each development task. This will be done with an eye on improving the total product and reducing redundancy and, thus, paper. Future WIPS will incorporate CASE and other development tools, when authorized, to reduce documentation costs and provide for the integration of the design and documentation processes into a single homogeneous (seamless) process. That is, documentation will be produced as a natural result of the planning, design and implementation process rather than as a separate activity.

Preface

This is the top-level CWO document used for defining and controlling the effort, organizational structure, management authority and responsibility, and resource allocations for the CWO. This is the baseline for continued enhancement and maintenance of the technical and management document developed under the guidelines set forth in DRD MA005 and in the ISDS Program Management Plan and is supported by the ISDS methodology.

The **order of precedence** is the ISDS contract and attachments, then the ISDS Project Management Plan and its supporting procedures, and then this plan. The ISDS Project Management Plan and supporting procedures can be explicitly waived with the concurrence of JPL and ISDS team management. Such actions and decisions are documented in Section 11, Deviations, Exceptions, and Waivers.

Table of Contents

1. Introduction	1
1.1 Background	1
1.2 Purpose	1
2. SOW & Deliverables	1
2.1 SOW	1
2.2 Deliverables	2
2.2.1 CWO Specific Deliverables	2
2.2.2 Deliverables Required by Contract or Derived from the CWO	3
3. CWO Development / Implementation Approach	3
3.1 CI Development	3
3.2 Documentation	4
4. Management Approach	4
4.1 Subcontractors	4
4.1.1 Computer Sciences Corp (CSC)	4
4.1.2 Affiliates/Consultants	4
4.2 CWO Change Management	4
4.3 Tracking the Work	4
5. Risk Management Plan	4
6. Work Breakdown Structure (WBS)	5
7.	5
7. CWO Organization and Staffing	6
7.1 CWO Staff Names, Qualifications, & Availability	6
7.2 CWO Organization	6
7.2.1 CWO in the JPL Organization	6
7.3 Staffing Profile	6
7.4 Estimation Approach	6
8. CWO Schedule and Dependencies	7
8.1 Schedule	7
8.2 Dependencies	7
9. GFE/GFI Items	7
10. Close-out Plan	7
11. Deviations, Waivers, & Exceptions	7

1. Introduction

This is a support task, beginning with many activities already in progress, providing assistance to JPL with requirements definition, functional design, implementation, test, and documentation for DSN communication system upgrade.

1.1 Background

DSN is geographically distributed, complex, reliable, communication network. The GCF Data Communications System (GDC) provides formatting, recording, processing, monitoring, and delivery of data block information to interfaces both within and outside DSN. The GCF Upgrade Task will provide a world-wide communication network connecting JPL with the Deep Space Communication Complexes (DSCCs) and Remote Mission Operations Centers.

The Metric Data Assembly (MDA) is the controlling assembly of the DSCC Tracking Subsystem and performs the following functions:

- Receives, stores, and processes support data: uplink predicts, Doppler predicts, standards and limits, spacecraft unique tables, and site dependent tables.
- Controls and monitors devices to obtain tracking data: Sequential Ranging Assembly (SRA) , Digitally Controlled Oscillator (DCO) and Frequency Counters.

1.2 Purpose

The purpose of CWO 9 is to provide software engineering support to correct anomalies in the OP-A Version of the Metric Data Assembly (MDA), perform additional testing to clear OP-B Block V Receiver (BVR) Lien, and continue work on OP-C MDA version for the Block V Exciter/Transmitter (ETX).

2. SOW & Deliverables

2.1 SOW

OP-B & C Continued Work

This CWO authorizes continued work on the OP-B Version of the Metric Data Assembly (MDA) which was delivered January 1995 to monitor operational performance and to perform additional Goldstone testing to clear the Block V Receiver (BVR) Lien. The OP-C MDA Version for the Block V Exciter / Transmitter (ETX) is continued in this time frame. The OP-C implementation is combined with the new work proposal items that were recently funded and the entire package will be delivered in the September 1995 time frame to meet DSS-24 uplink capability operational commitment.

TASK DETAILS:

All work shall be in accordance with JPL D-4000 Standards. Software development schedules shall include well identified demo tests to verify incremental capabilities. The OP-B MDA Lien for the BVR shall be cleared in March 1995 following on-site testing at Goldstone. The contractor shall provide the following:

- Presentation materials and S/W status review for the OP-C Implementation
- Preliminary and final software supporting documentation
- Software source code and program build procedures
- Demo test procedures and reports documenting results

The contractor shall assist JPL personnel in the conduct of tests to verify capability and in characterizing and diagnosing problems encountered in the field.

OP-A Anomaly Correction

Correct selected anomalies that affect the OP-A Version of the MDA and thereby reduce the Operator's workload while improving reliability and decreasing susceptibility to error.

TASK DETAILS:

Deliver a new version of the OP-A MDA software that fixes all or a selected group of these anomalies:

- Anomaly 19043: Day-of-year (DOY) is required on all UPC Operator Directives (OD). It should be an optional field and default to the current DOY if not entered.
- Anomaly 21942: The MDA software is incorrectly calculating Pseudo-DRVIDs in an x-band uplink configuration.
- Anomaly 22015: MDA does not always correctly process all the down-link predicts. When this occurs, the MDA has to be rebooted and the predicts must be resent from the CMC to the MDA.
- Anomaly 22016: The DCO is reporting incorrect DOY (001). When this happens, the "M UPC PRE" OD must be re-entered to set the DCO to the correct DOY.
- Anomaly 23751: The MDA range record processing incorrectly interprets the range data when it has a value expressed in hexadecimal seconds that ends in 02 (this actually occurred with the DSPSE spacecraft preventing the transmission of range data. The problem is a liability for all projects requiring SRA range data).

NOTE: The above fixes will be delivered in OP-C version of the MDA software.

2.2 Deliverables

2.2.1 CWO Specific Deliverables

CWO 9 - DSCC Tracking Subsystem (DTK) Software Metric Data Assembly

	<u>Task Description</u>	<u>Completion Date</u>
1	MDA OP-B Clear Lien / Code Delivery	3/31/95
2	MDA OP-C ETX-MDA Interface Agreement at Lev 4	11/30/94
3	MDA OP-C SOM & STP-1 Prelim Docs	1/15/95
4	MDA OP-C S/W Peer-level Design/Status Review	2/20/95
5	MDA OP-C Demo Tests	3/1/95 - 7/1/95
6	Uplink hardware shipment to DSS-24	4/3/95
7	MDA OP-C Final SOM & RDD Docs	8/1/95
8	MDA OP-C Testing complete/code delivery	9/1/95
10	DSS-24 Uplink operational	8/4/95
11	MDA OP-C Remaining Docs	9/15/95
12	MDA OP-C Software Transfer	9/15/95

2.2.2 Deliverables Required by Contract or Derived from the CWO

See contract No. 960100 for specific data requirements of the CDRLs identified below.

1. MA005 - CWO Implementation Plan - draft, final, and updates as required
2. MA006 - Monthly Progress Report
3. MA007 - CWO Weekly Status and Major Problems Report

3. CWO Development / Implementation Approach

3.1 CI Development

The software is developed on Modcomp 68K and 88K based platforms located at the ISDS facility. The Modcomps use Real/IX a Unix type operating system tailored for the real-time environment. All tools required for development reside on the Modcomps.

After coding, the software is tested using simulation tools (including the SIV) executing on the Modcomps. The software is then tested at DTF-21 which contains real hardware that the MDA software interfaces with. Finally the software is tested at the DSCC using real and simulated tracks. Concurrent with this testing are updates to any test procedures to be used as part of acceptance.

Completion of the above testing means the software is ready for acceptance test. Prior to this testing the software is moved from the developer configuration management system (SCCS) to the ISDS configuration management system (CCC). The software is then transferred to SPMC and a 'green disk' created. This software is then acceptance tested at the DSCC.

3.2 Documentation

Documentation tasks consists of preparing new or modifying existing documentation using Word or Word Perfect with final formatting to DSN standards accomplished by the ISDS technical publications group. The final versions are delivered to SPMC in electronic format.

4. Management Approach

The management approach for this CWO is derived from and is consistent with the ISDS Program Management Plan. CWO specific items are limited to the WBS and the details of the CWO.

4.1 Subcontractors

4.1.1 Computer Sciences Corp (CSC)

Infotec has retained CSC as its subcontractor for the ISDS contract. The terms and conditions of this subcontract are contained in Infotec's subcontractor agreement SK9503.

The ISDS team which consists of Infotec and CSC operates as a virtual corporation with all direction and decisions residing with the Infotec PM. Technical direction of each CWO resides with the CWO manager regardless of company affiliation. CWO staffing is based on the best personnel able to meet the needs of the CWO without regard for company. JPL's interfaces with a single point of contact, the ISDS team.

4.1.2 Affiliates/Consultants

There are none.

4.2 CWO Change Management

Change management for this CWO follows the process defined in the ISDS program Management Plan and in the Contract.

4.3 Tracking the Work

Schedules are given to all personnel working on the CWO. The schedule contains the individual's tasks and expected completion/milestone dates. In addition, all CWO personnel are given a Work Authorization Document (WAD) which contains valid time charge numbers correlated to the CWO tasks.

Weekly status reports are submitted by the CWO personnel to their CWO manager. These reports are used to update the CWO schedule contained in Microsoft Project and track CWO progress. CWO costs are collected and tracked in Microframe using CWO personnel timecard data and MIS data downloaded from corporate computers.

5. Risk Management Plan

Risks specific to this CWO are presented in the following two tables. The first, Table 5-1, enumerates the high level risks associated with this CWO and with most CWOs.. The second, Table 5-2, enumerates critical risks, impact, and the technical and managerial mitigation strategies for this CWO.

**Table 5-1 - High Level Risks for the CWO and
How the ISDS Team Significantly Mitigates their impact on JPL**

Type	Factor	CWO	Mitigation
known	Assumptions	Skill mix Technical Assumptions	Scope of CWO Scope of CWO
potential	Commitments	GFE availability and quality	Identify it all, plan for it
	Technical / Management	Estimates & assumptions Interpretation of requirements Availability of key personnel	Interface with JPL to identify ahead of time Interface with JPL to identify ahead of time Skills are generally available in the job market
	Knowledge loss at CWO end	Inability to respond to problems or change requests	All work is documented and checked.
Unknown	--	Changing funding & priorities Changing requirements Key personnel attrition	All work is documented and checked. All work is documented and checked and necessary skills are generally available in the local job market

Table 5-2 CWO Requirements Risks, Impact, and Mitigation Strategies

Risk	Impact if Risk Realized	Mitigation
ETX H/W not available	Lien of software	Test to fullest capability using simulation
Key JPL person Scott Bryant availability	Schedule delays due to learning curve for track data and interfaces	Interface with Scott early on to reduce his need later for the critical knowledge he possesses.

6. Work Breakdown Structure (WBS)

The CWO uses the standard ISDS WBS, modified to reflect the SOW.

Employee:	Robert Shaw	Company:	CSC
Start Date:	12/14/94	End Date:	9/17/95
		Revision:	-1-

WBS Number	Description of Work
11	CWO management, planning, reporting, estimating
22	Mission/System Requirements Analysis (SRR)
23	System Analysis & Design (SDR)
27	Engineering change analysis & design
31	Metric Data Assembly software
312	Software Design (PDR and CDR)
313	Implementation, unit test, developer integration & preparing draft of Software source code and program build procedures and preliminary ... software supporting documentation
314	Initial software maintenance -- Assist JPL ... in characterizing and diagnosing problems encountered in the field
391	Demo test procedures and reports documenting results -- Test: planning, drafting scenarios, testing, analysis, reporting
74	System Installation & checkout
75	Supporting system operation
84	Training preparation: audience identification & assessment, syllabus generation, creating lessons & training materials
85	Holding training classes

7. CWO Organization and Staffing

7.1 CWO Staff Names, Qualifications, & Availability

Since this CWO is an extension of the effort under Telos CWO 4, Robert Shaw (identified by JPL as key to effort) has been transferred to the ISDS team and is available full time for the task duration.

Randy Tang will join this CWO as a Programmer/Analyst beginning March 1995. Randy's background includes a strong C and Unix background with emphasis on real-time distributed environments.

7.2 CWO Organization

CWO task manager is Chad Nikoletich, who reports to the ISDS program manager, Kent Thomson.

7.2.1 CWO in the JPL Organization

This CWO supports R. Crowe of Metric and Antenna Control Systems, a branch of Section 394, Network Engineering.

7.3 Staffing Profile

This is an LOE task for two person for the specified period. It has a constant two (2) FTE staffing profile beginning March 1995.

7.4 Estimation Approach

Estimation for accomplishing this work is based on engineering judgment and experience acquired from previous DSN work.

8. CWO Schedule and Dependencies

8.1 Schedule

See attached schedule.

8.2 Dependencies

Dependencies are those items outside the control of the CWO manager. We identify them here so we can plan for and manage them. Critical dependencies, if any, are included in the Risk Management Plan. The dependencies on this CWO are:

Mission constraints: None

JPL facilities: DTF-21, Goldstone availability.

JPL support: DTF-21, ETX hardware, Goldstone and Scott Bryant.

User availability: None

Site personnel: DTF-21 and Goldstone personnel availability.

GFE/GFI: none.

9. GFE/GFI Items

No particular GFE items are dedicated to this CWO. For a list of all GFE items utilized by the ISDS team refer to the ISDS GFE List.

10. Close-out Plan

This section will be provided 30 days prior to CWO end.

11. Deviations, Waivers, & Exceptions

This CWO has no deviations to established standards and procedures.